

Perchlorate in the Environment: Fate in Saturated Sediments and Surface Waters

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Research Need

- **Exposure is dependent on both spatial and temporal distribution.**
- **Typical sampling methods unable to achieve required resolution.**
- **Remediation strategies will be influenced by natural attenuation mechanisms.**



Objectives

- Spatial and temporal variation of perchlorate in sediments.
- Plant uptake and release in aquatic and terrestrial systems.
- Degradation of perchlorate in sediments.
 - Inhibition
 - Prior exposure
 - Seasonal Fluctuations
- All determine both the magnitude and length of exposure.



Study Sites-

Lake Waco and Belton Watersheds

- **High Resolution (cm) Sediment Sampling**
 - NO_3^- , SO_4^{2-} , ClO_4^-
 - Seasonal Studies
 - Multiple Sites
- **Plant uptake**
 - Aquatic and Terrestrial Vegetation Sampling
 - Seasonal uptake
 - Multiple Sites
- **Sediment Microcosm Studies (Rates of Degradation)**
 - Inhibition by NO_3^-
 - Seasonal Studies
 - Multiple Sites



Study Sites

Interfaces between water and sediment and water and vegetation.



Locations of groundwater inflow and outflow.

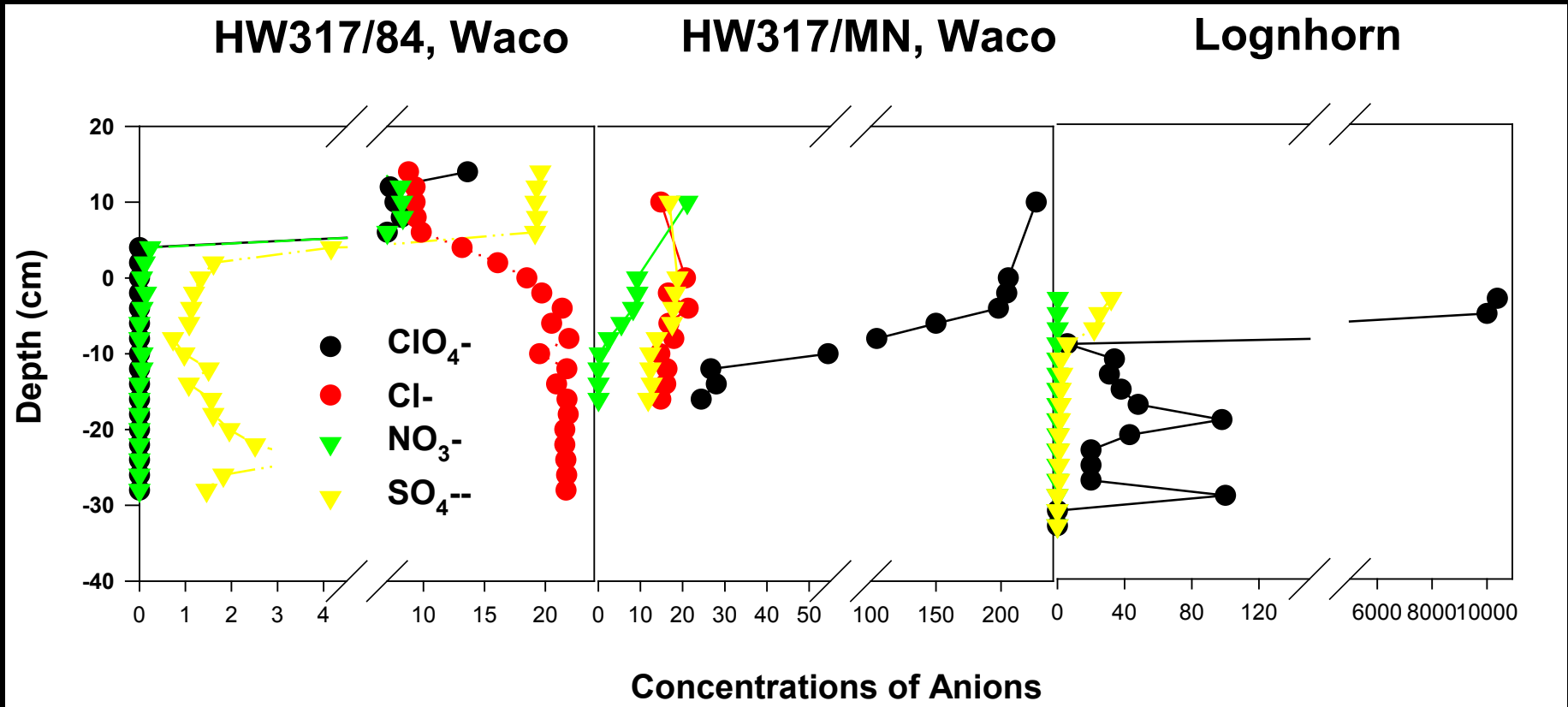


Sites Studied

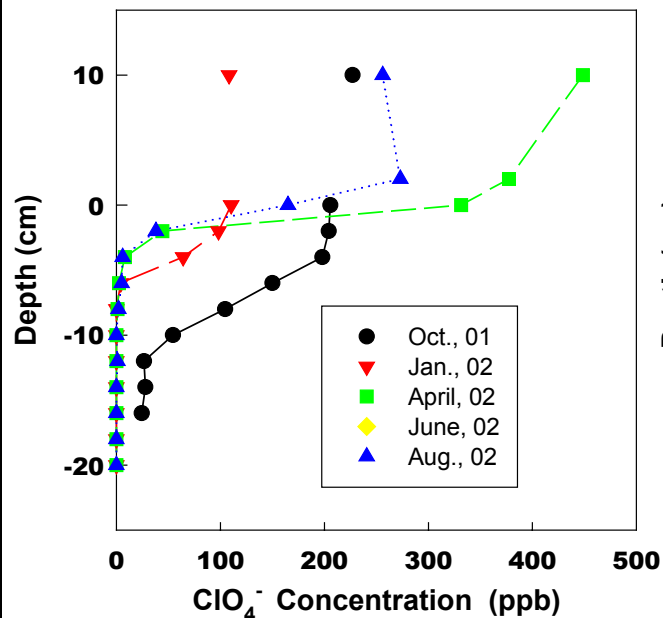
Streams Bordered by
Aquatic and Terrestrial
Vegetation



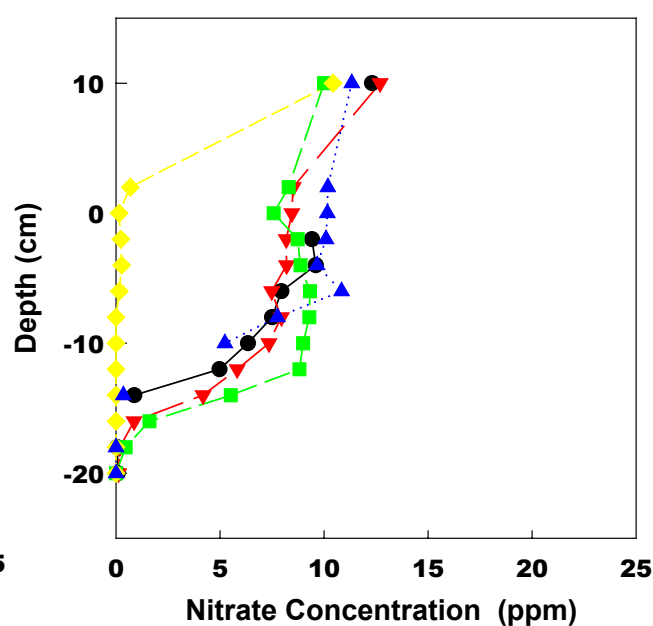
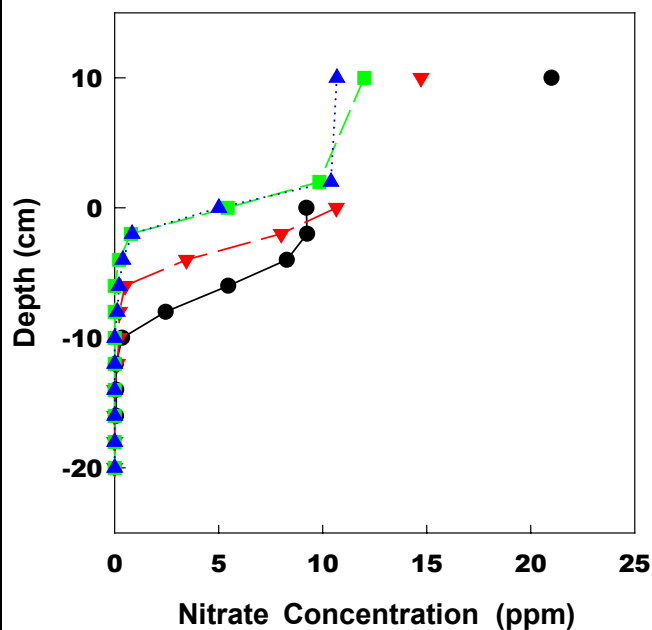
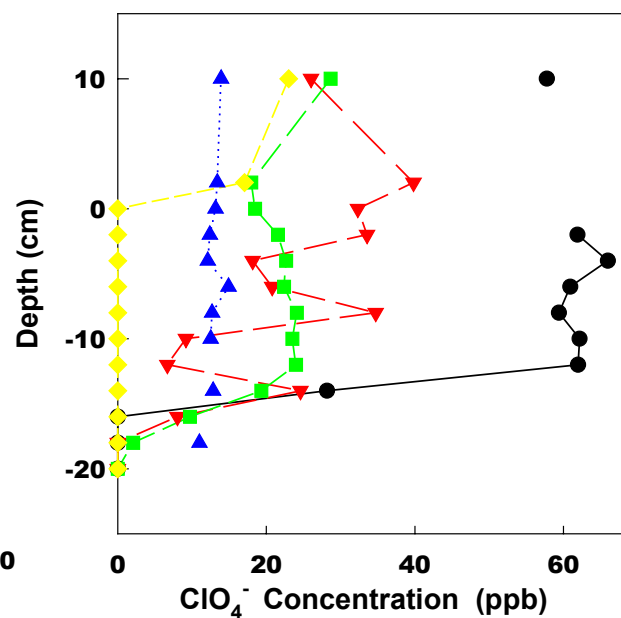
Distribution of Anions in Sediments



Site 317/MN

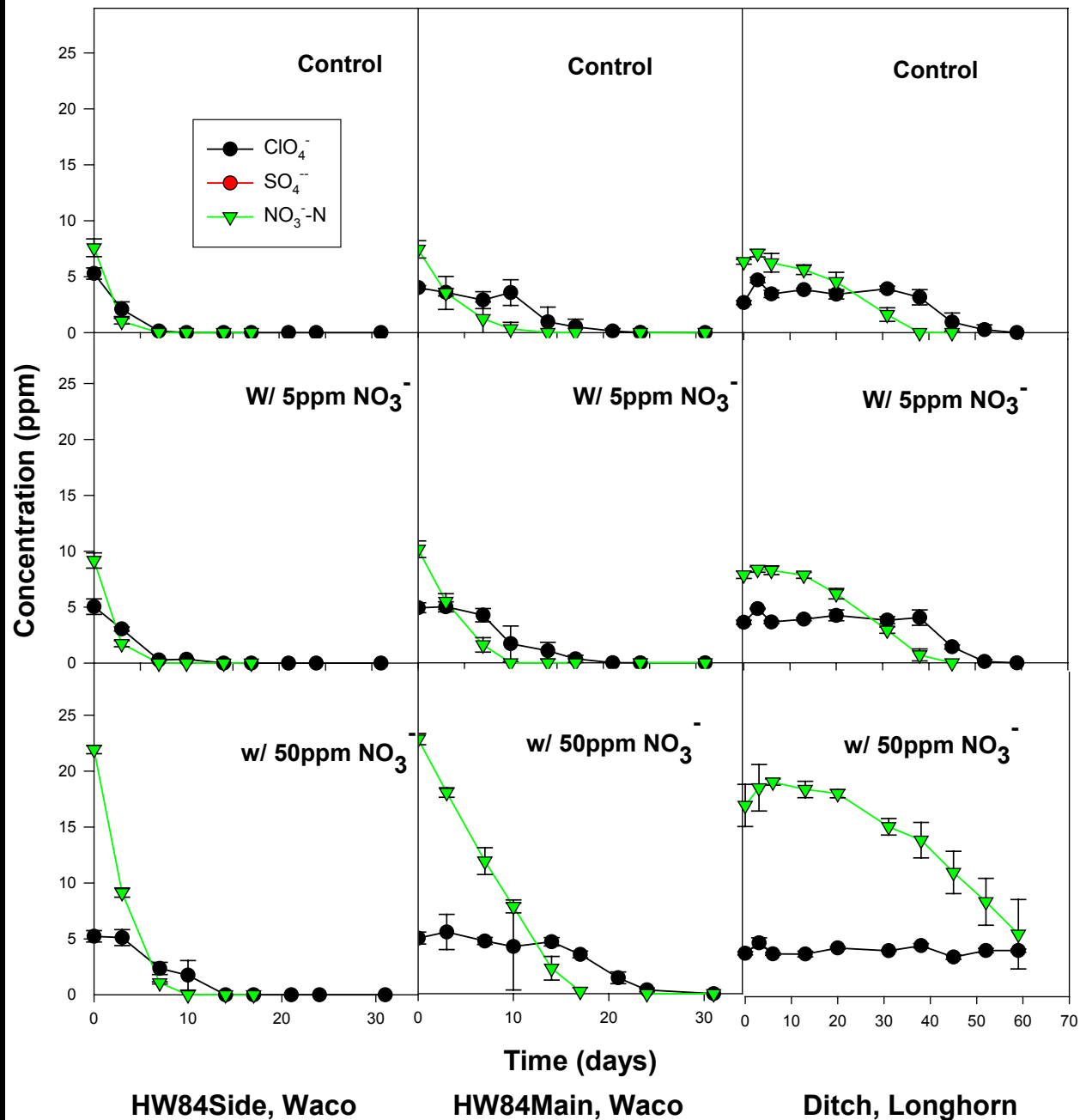


Site SS HW84



**Seasonal
Variation in
ClO₄⁻ and
NO₃⁻**

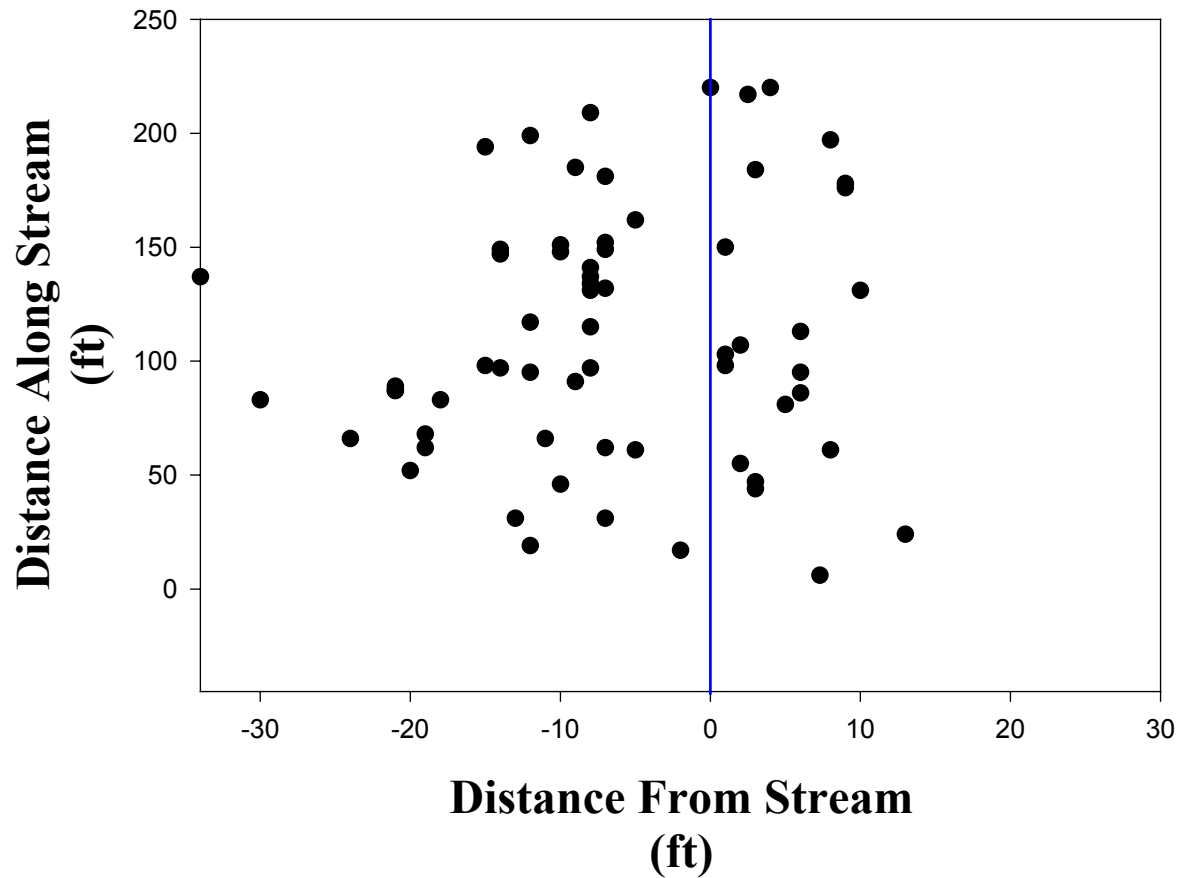




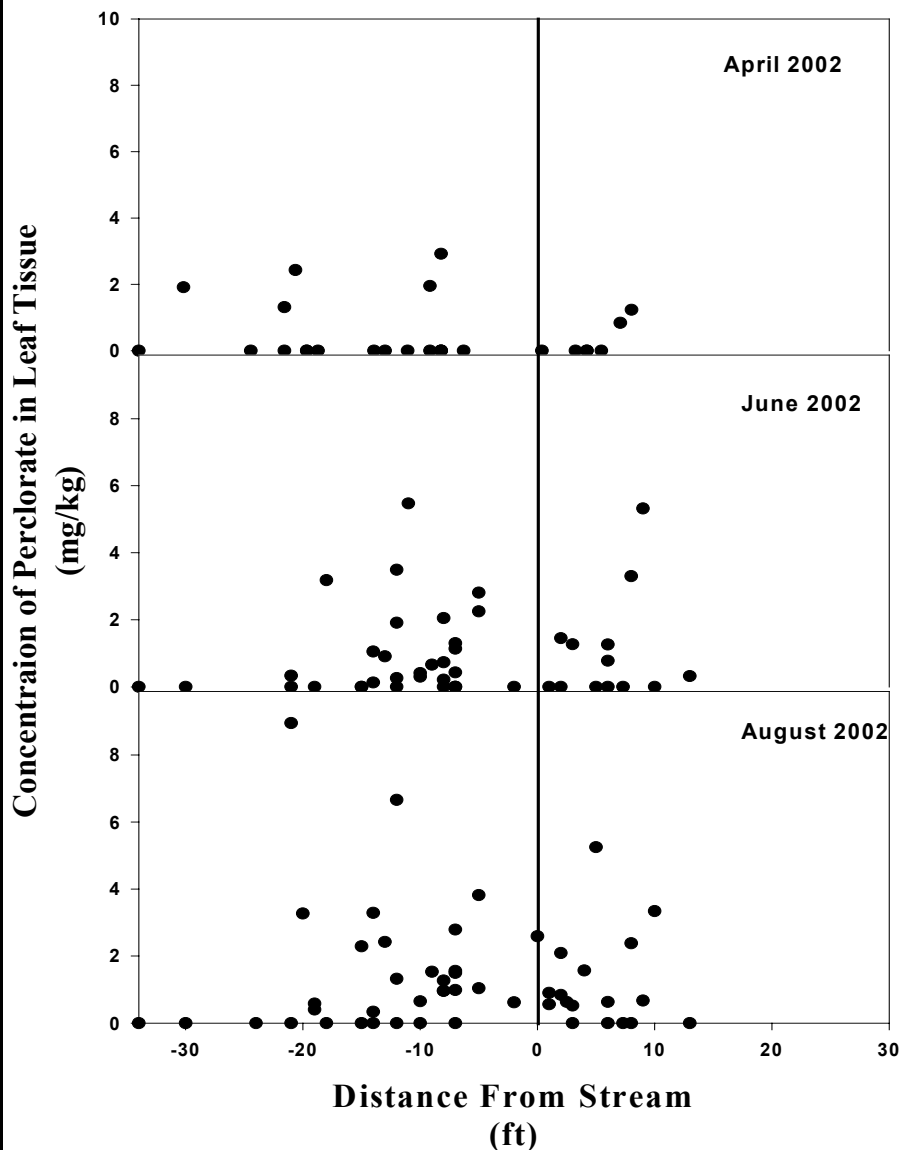
Degradation of ClO_4^- and NO_3^- in Sediments



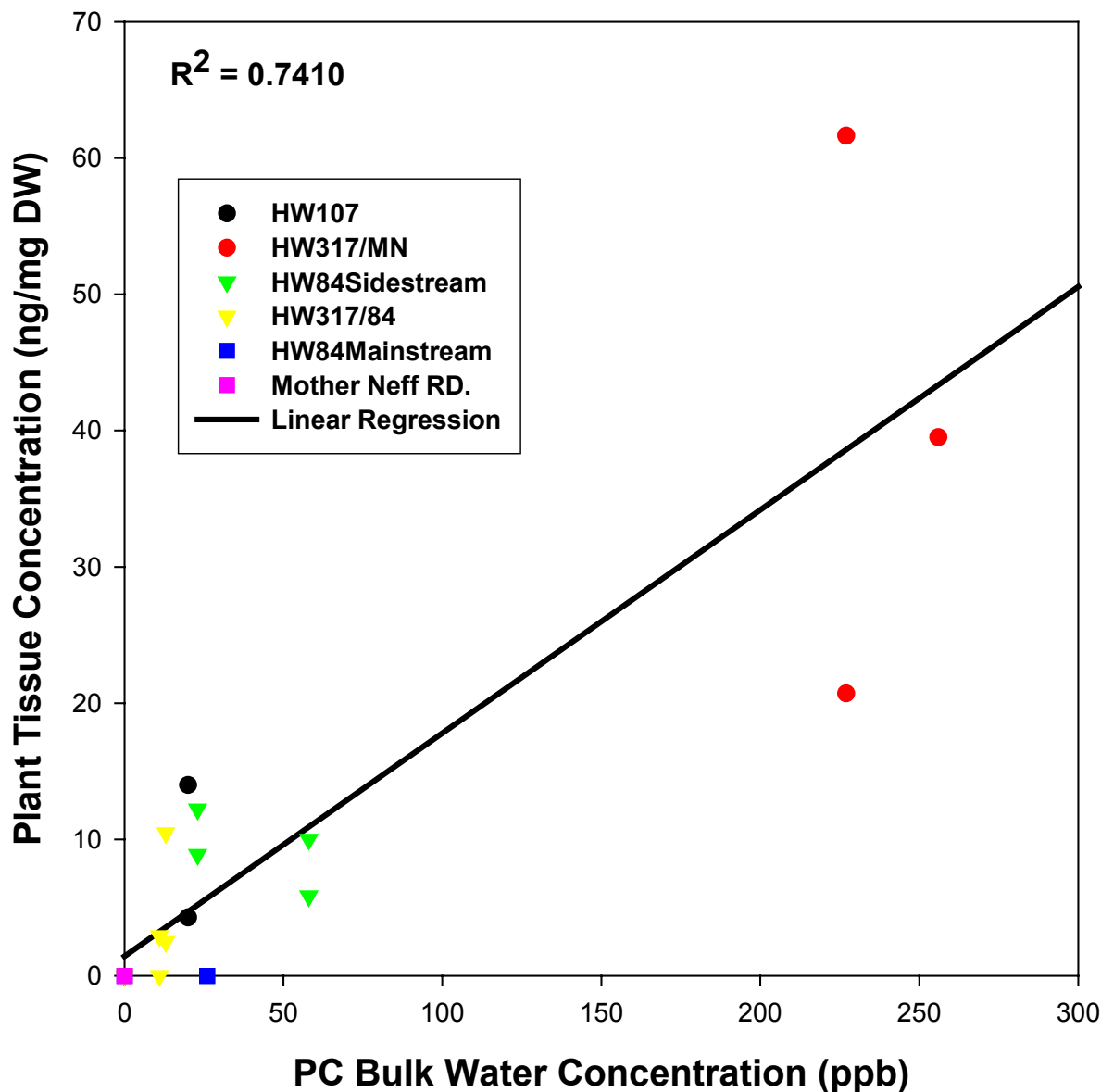
Distribution of Trees Sampled Along Perchlorate Contaminated Stream



ClO_4^- Distribution in Tree Leaves along a Contaminated Stream



Correlation between ClO_4^- in bulk water and Smart weed



Conclusions

- **Distribution of perchlorate in sediments is seasonally and spatially variable.**
- **Distribution of perchlorate closely mirrors nitrate distribution.**
- **Degradation of perchlorate in sediments is controlled by nitrate.**
- **Vegetation will uptake perchlorate.**



Other On-Going Research

- **Re-release of Perchlorate from Plant Tissue.**
- **Treatment Potential of Artificial and Natural Wetlands.**
- **Role of Nitrogen Source in Plant Uptake.**
- **Role of TDS in Plant uptake.**

